SPECIFICATION

Electronic Version 1.2.8

Stylesheet Version 1.0

[FLOATING WINDOW]

Background of Invention

[0001] Field of the Invention

[0002] The invention relates in general to a transparent window, and more particular, to a floating window suitable for use in a flatbed scanner.

[0003] Related Art of the Invention

[0004] In the recent years, the great advancement of computer and the highly developed Internet and multi-media techniques allow extracting an image pattern from a digital camera (DC) directly. On the other hand, the image input process of other relative documents or pictures require an optical scanner to obtain an analog image therefrom. The analog image is then converted into a digital signal to be output. The users can thus perform display, recognition (OCR), edit, storage and output operation of the image file in a computer or an electronic product.

[0005] According to the input method, the optical scanner can be categorized into palm scanner, sheet feed scanner, drum scanner and flatbed scanner. As the flatbed scanner has a more stable image scanning quality and functions of document (film and projection film) reflection and transmission, plus an additional automatic document feeder (ADF) can be used to continuously scan a whole stack of documents with the same size; therefore, the flatbed scanner becomes one of the most commonly used optical scanners currently.

[0006]

The flatbed scanner incorporates a transparent flat panel, for example, a piece of glass or transparent plastic, mounted on a top lid of thereof for disposing the document to be scanned. Using a belt driving apparatus and the bearing positioning mechanism, the optical scan module, that is, the chassis, inside of the flatbed scanner

is linearly directed, such that the internal linear optical sensor of the chassis such as the charge-coupled device (CCD) or the contact image sensor (CIS) is driven to scan the surface of the document, so as to obtain an analog image signal. The analog image signal is then converted into a digital image signal to be output.

[0007] Referring to Figures 1A and 1B, the top lid and the transparent flat panel of a conventional flatbed scanner before assembly are schematically illustrated. In Figure 1A, an opening 12 is formed at a center of the top lid 10 of the flatbed scanner. A transparent flat panel 20 is typically disposed on a bottom wall of the top lid 10. The surface area of the transparent flat panel 20 is slightly larger than the size of the opening 12. Therefore, the opening 12 is completely covered with the transparent flat panel 20. An adhesive region 22 is formed surrounding the opening 12 on the bottom wall of the top lid 10 to attach the transparent flat panel 20. As shown in Figure 1B, the central region of the transparent flat panel 20 is positioned and exposed over the opening 12 where the document to be scanned is disposed.

[0008] During the assembly of the chassis of the flatbed scanner, an adjusting toll is used to adjust the focus of the chassis. For the assembly process of the transparent flat panel, as mentioned above, the transparent flat panel is directly adhered on the bottom wall of the top lid without any correction operation. Therefore, when the document is scanned by the chassis, once the top lid or the base is deformed or the internal base of the flatbed scanner is not sufficiently planar, the distance between the transparent flat panel and the chassis is not constant. Consequently, deviation between the scanned image and the actual image of the document is caused. Especially for the scanning system of the contact image sensor, or for the high-resolution or low-depth optical scan module, the distance between the transparent flat panel and the optical scan module often seriously affects the image scan quality of the flatbed scanner.

Summary of Invention

[0009] The invention provides a floating window used as a platform for disposing a document in a flatbed scanner. When the optical scan module is scanning the document, the floating window is undulating corresponding to the movement of the optical scan module. Consequently, the document disposed on the floating window is

also undulating up and down accordingly. As a result, the distance between the document and the optical scan module is constant, so that the image scan quality of the flatbed scanner is effectively enhanced.

[0010] The present invention provides a floating window suitable for use in a flatbed scanner. The flatbed scanner has at least a top lid and an optical scan module. The top lid has an opening, under which the optical scan module is shifting periodically, a top surface, and an opposing bottom surface. The floating window comprises a supporting member disposed on the top lid. The supporting member has a supporting surface, which can be used to contact with a periphery of a bottom surface of a transparent flat panel. The floating window further comprises a limiting member disposed on the top lid. The limiting member has a limiting surface located on a periphery of the top surface. The floating window also has a flexible member located between the supporting member and the limiting member. The optical scan module can thus push the bottom surface of the transparent flat panel upward, while the flexible member can press the top surface of the transparent flat panel downward.

[0011] Therefore, when applying the floating window of a flatbed scanner for scanning, the distance between the transparent flat panel with floating window and the optical scan module is kept constant, such that the distance between the document disposed on the transparent flat panel and the optical scan module is maintained constant to enhance the image scan quality of the flatbed scanner.

Brief Description of Drawings

[0012] These, as well as other features of the present invention, will become more apparent upon reference to the drawings wherein:

[0013] Figures 1A and 1B are schematic drawings of the top lid and transparent flat panel of a conventional flatbed scanner before assembly;

[0014] Figures 2A and 2B are a top view and cross-sectional view of a floating window disposed on a top lid of a flatbed scanner according to the invention;

[0015] Figure 3 is a schematic drawing showing the operation of a floating window applied to a flatbed scanner; and

[0016] Figures 4A and 4B are local enlarged views of portions of Figure 3.

Detailed Description

[0017] Referring to Figures 2A and 2B, a top view and a cross-sectional view of an embodiment of a floating window are schematically shown. The top lid 10 of the flatbed scanner has an opening 12 therein. The floating window 100 is embedded in the opening 12. The floating window 100 comprises a transparent flat panel 110, a supporting member 120, a limiting member 130 and a flexible member 140. The material of the transparent flat panel 110 includes glass or transparent plastic. The transparent flat panel 110 has a top surface 112 and an opposing bottom surface 114. The transparent flat panel 110 can be either disposed under or over the opening 12. In addition, the area of the transparent flat panel 110 is slightly larger than that of the opening to provide a complete coverage thereof. However, as shown in Figure 2B, two sides of the transparent flat panel 110 do not completely cover the opening 12 for the sake of description convenience.

[0018] As shown in Figures 2A and 2B, the supporting member 120 of the floating window 100 is disposed on a surface of the top lid 10, for example, on a bottom surface of the top lid 10. The supporting member 120 extends under an edge or a periphery of the bottom surface 114 of the transparent flat panel 110 and is integrally formed with the surface of the top lid 10. The supporting member 120 has a supporting surface 122 located under the edge or periphery of the bottom surface of the transparent flat panel 110 to be in contact with and support the edge or periphery of the bottom surface 114.

[0019] Similar to Figures 2A and 2B, the limiting member 130 of the floating window 100 is also located on the surface of the top lid 10, for example, on an inner wall of the opening 12 of the top lid 10. The limiting member 130 extends over the edge or periphery of the transparent flat panel 110 and is formed integrally with the surface of the top lid 10. The limiting member 130 has a limiting surface 132, which is located over the edge or periphery of the top surface 112 of the transparent flat panel 110 in correspondence with the position of the supporting surface 122. The distance between the supporting surface 122 and the limiting surface 132 is slightly larger than a thickness of the transparent flat panel 110 to allow a vertical movement of the

transparent flat panel 110 along a normal direction of the top surface 112 (or the bottom surface 114).

[0020] As shown in Figures 2A and 2B, the flexible member 140 of the floating window 100 is disposed between the edge of the top surface 112 of the transparent flat panel 110 and the limiting surface 132 of the limiting member 130. Therefore, the flexible member 140 presses the edge of the bottom surface 112 of the transparent flat panel 110 downward. Meanwhile, the edge of the bottom surface 114 of the transparent flat panel 110 is in contact with the supporting surface 122 of the supporting member 120. Therefore, the transparent flat panel 110 is experiencing an upward supporting force provided by the supporting member 120. The flexible member 140 includes the foldable dust-proof cloth. After being folded, the flexibility allows it to be applicable as the material of the flexible member 140.

[0021] In the floating window 100 as shown in Figure 2A, the supporting member 120 can be divided into four parts, which are located under the edges at two sides of the bottom surface 114 of the transparent flat panel 110, respectively. The limiting member 130 has two parts located over the edge at two sides of the top surface 112 of the transparent flat panel 110 in correspondence with the positions of the supporting member 120. The flexible member 140 is located between the limiting member 130 and the transparent flat panel 110, while a portion of the transparent flat panel 110 extends under the opening 12 and other region.

[0022] To describe the function of the floating window 100 in detail, please refer to Figure 3, in which the operation of the floating window 100 of a flatbed scanner is schematically shown. The optical scan module 30 of the flatbed scanner is located under the opening 12 of the top lid 10. Being driven by a driving apparatus, the optical scan module 30 moves periodically along the arrows to scan a document 40 disposed on the top surface 112 of the transparent flat panel 110. A pushing device 32 is also installed over the optical scan module 30 to push the bottom surface 114 of the transparent flat panel 110. Thereby, the transparent flat panel 110 is pushed upward slightly; and consequently, the flexible member 140 is slightly compressed upward, so that a downward elastic force is generated by the flexible member 140.

[0023] As mentioned above, when the optical scan module 30 is periodically shifted

under the optical scan module 30, the pushing device 32 is consequently driven to move. The pushing device 32 is always in contact with the bottom surface 114 of the transparent flat panel 110, so that the distance between the optical scan module 30 and the transparent flat panel 110 is kept constant. That is, during the whole scanning operation of the optical scan module 30, the optical scan module 30 is spaced from the document 40 by a constant distance. That is, the invention uses the elastic force applied to the transparent flat panel 110 generated by the flexible member 140 to allow a vertical movement between the supporting member 120 and the limiting member 130 in correspondence with a slight undulation of the optical scan module 30. As a result, the distance between the optical scan module 30 and the transparent flat panel 110 is kept constant for the whole scanning process. Consequently, the distance between the document 40 disposed on the transparent flat panel 110 and the optical scan module 30 is kept constant.

[0024] Referring to Figures 3, 4A and 4B, where Figures 4A and 4B show local enlarged views of Figure 3, the pushing device 32 of the optical scan module 30 pushes the bottom surface 114 of the transparent flat panel 110 upwardly. In Figure 4A, the pushing device 32 includes a cam 32a formed on top of the optical scan module 30 to correspond to the periodic displacement of the optical scan module 30. The pushing device 32 moves slides under the bottom surface 114 of the transparent flat panel 110, and the cam 32a can be formed integrally with the optical scan module 30. In addition, as shown in Figure 4B, the pushing device 32 can also be a pushing drum 32b pivotally mounted on top of the optical scan module 30. Similarly, in response to the periodic movement of the optical scan module 30, the drum 32b rolls underneath the bottom surface 114 of the transparent flat panel 110. In addition, to prevent the movement of the pushing device 32 from being interfered with by the supporting member 110, as shown in Figure 2A, the transparent flat panel 110 can extend beyond the region under the opening 12. For example, the extension towards the edges of the transparent flat panel 110 can be used as the displacement region of the pushing device 32 as shown in Figure 3.

[0025] In the embodiment of the invention, the transparent flat panel is allocated between the supporting member and the limiting member, and the flexible member is disposed between the limiting member and the transparent flat panel to allow the

transparent flat panel entering a floating state upon being pushed by the optical scan module and pressed by the flexible member. As a result, the document disposed on the transparent flat panel is undulated up and down in accordance with the movement of the optical scan module. The distance between the document and the optical scan module can be kept constant during the scan process, so that the image scan quality of the flatbed scanner can be improved.

[0026] In addition, a periphery of the top surface of the transparent flat panel can be indirectly adhered to a periphery of the bottom surface surrounding the opening of the top lid via the flexible member. That is, the flexible member is disposed between the edge of the top surface of the transparent flat panel and the edge of the bottom surface of the top lid to achieve the floating effect. In addition, the floating window may include the above supporting structure and limiting structure disposed on the surface of the top lid. Using similar connection, the supporting structure and the limiting structure are positioned at the edges of the transparent flat panel. Further, the distance between the supporting member and the limiting member is slightly larger than the thickness of the transparent flat panel, such that the transparent flat panel can make a vertical movement between the supporting surface and the limiting surface to achieve a floating effect.

[0027] According to the above, the floating window allows the transparent flat panel undulating vertically with respect to the optical scan module, so that the distance between the document disposed on the transparent flat panel and the optical scan module is kept constant. Therefore, the image scan quality of the flatbed scanner is effectively enhanced, particularly for those scanning systems with a contact image sensor or high-resolution or shallow depth optical scan modules.

[0028] Other embodiments of the invention will appear to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.